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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/800,575	03/15/2004	Jeremy H. Burroughes	29610/CDT087B1	1720

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EXAMINER

COLON, GERMAN

ART UNIT	PAPER NUMBER
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2879

DATE MAILED: 12/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/800,575

Applicant(s)

BURROUGHS ET AL.

Examiner

German Colón

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6,9-25,28-47 and 50-67 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6,9-25,28-47 and 50-67 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 October 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10/05/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The Amendment, filed on September 29, 2004, has been entered and acknowledged by the Examiner.
2. Cancellation of claims 7-8, 26-27 and 48-49 has been entered.
3. Addition of claims 62-67 has been entered.

Claim Objections

4. Claims 10, 29 and 51 are objected to because of the following informalities:

In the Markush group, Sm is recited twice.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 9-10, 15-21 and 62 are rejected under 35 U.S.C. 102(b) as being anticipated by Guha et al. (US 5,739,545).

Regarding claims 1 and 62, Guha discloses an opto-electrical device comprising (see at least Figs. 3 and 7):

an anode electrode 74;

a transparent cathode electrode **78,80**;

an opto-electrically active region **76** located between the electrodes;

the cathode electrode including a first layer (layer **78** closer to **80**) comprising a compound of a transition metal; a second layer (layer **78** closer to **76**) comprising a material having a work function below 3.5 eV; and a third layer **80** spaced from the opto-electrically active region by the first and second layers and having a work function above 3.5 eV, wherein the first layer is spaced from the opto-electrically active region by the second layer.

Regarding claim 9, Guha discloses the second layer being adjacent the opto-electrically active layer (see Figs. 3 and 7).

Regarding claim 10, Guha discloses the second layer comprising Ca.

Regarding claim 15, Guha discloses the material having a work function above 3.5 eV having an electrical conductivity greater than $10^5 (\Omega \cdot \text{cm})^{-1}$.

Referring to claim 16, Guha discloses the material having a work function above 3.5 eV being selected from the group consisting of Al and ITO.

Referring to claims 17-20, Guha discloses the opto-electrically region comprising a conjugated polymer material.

Referring to claim 21, Guha discloses a charge transport layer between the light emissive material and one of the electrodes (see Fig. 3).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 42, 50-51, 56-61 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Enokida et al. (US 5,698,740) in view of Guha et al. (US 5,739,545).

In regards to claims 42 and 64, Enokida discloses an opto-electrical device comprising (see at least Fig. 2):

an anode electrode 2;

a cathode electrode 6; and

an opto-electrically active region capable of generating an electrical field in response to light located between the electrodes (see Col. 1, lines 12-16). Enokida is silent regarding the properties of the cathode.

However, in the same field of endeavor, Guha discloses a cathode including a first layer (layer 78 closer to 80) comprising a compound of a transition metal; a second layer (layer 78 closer to 76) comprising a material having a work function below 3.5 eV; and a third layer 80 spaced from the opto-electrically active region by the first and second layers and having a work function above 3.5 eV, wherein the first layer is spaced from the opto-electrically active region by the second layer. Guha teaches the suitability of said structure for satisfying the following conditions: (1) transparency, (2) provides a low resistance, (3) provides sufficiently high lateral conductivity; (4) acts as a protective film to the opto-electrically active region and (5) allows deposition in a benign fashion without damaging the opto-electrically active region.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the electrode disclosed by Guha in the opto-electrical device of

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Enokida, with the purpose of providing a cathode satisfying at least the aforementioned 5 conditions.

In regards to claim 50, Enokida-Guha discloses the second layer being adjacent the opto-electrically active layer (see Figs. 3 and 7 of '545 in view of Fig. 2 of '740).

In regards to claim 51, Enokida-Guha discloses the second layer comprising Ca.

In regards to claim 56, Enokida-Guha discloses the material having a work function above 3.5 eV having an electrical conductivity greater than $10^5 (\Omega \cdot \text{cm})^{-1}$.

In regards to claim 57, Enokida-Guha discloses the material having a work function above 3.5 eV being selected from the group consisting of Al and ITO (see Figs. 3 and 7 of '545).

In regards to claim 58, Enokida-Guha discloses the cathode being transparent (see Fig. 3 of '545).

In regards to claims 59-60, Enokida discloses the opto-electrically region comprising a conjugated polymer material.

In regards to claim 61, Enokida discloses a charge transport layer between the light emissive material and one of the electrodes (see Fig. 2).

Double Patenting

9. Claims 1-6, 9-25, 28-47 and 50-67 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-22 of U.S. Patent No. 6,707,248 and alternatively over claims 1-20 of U.S. Patent No. 6,765,350. Although the

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conflicting claims are not identical, they are not patentably distinct from each other for the reasons given below.

US Application SN 10/800,575	US Patent No. 6,707,248	Reasons for rejection under obviousness-type double patenting:
Claim 1	Claim 7 in view of Claim 17	<p>US '248, claim 7, claims an opto-electrical device comprising: an anode electrode; a cathode electrode; an opto-electrically active region located between the electrodes; the cathode electrode including a first layer comprising a compound of a group 1 metal, a group 2 metal, or a transition metal; a second layer comprising a material having a work function below 3.5 eV; and a third layer spaced from the opto-electrically active region by the first and second layers and having a work function above 3.5 eV, wherein the first layer is spaced from the opto-electrically active region by the second layer.</p> <p>Claim 7 is silent regarding the cathode being transparent. However, Claim 17 claims said cathode to be transparent. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make transparent the cathode recited by claim 7, in order to allow the transmission of light through the cathode side.</p>
Claims 2-4	Claims 4 and 7	US '248 claims the compound being a compound of a group 1 metal, said metal being Li.
Claims 5-6	Claim 7 in view of Claim 6	US '248, claim 7, claims the compound being a halide. It would have been obvious to one of ordinary skill in the art to use a fluoride as a halide since claim 6 claims the desirability of using fluoride.
Claims 9-10	Claims 7 and 10	US '248 claims the second layer being adjacent to the opto-electrically active layer and said second layer comprises a metal selected from the group consisting of Li, Ba, Mg, Ca, Ce, Cs, Eu, Rb, K, Y, Sm, Na, Sr, Tb, Yb, and alloys of two or more of those.
Claim 11	Claim 11	US '248 claims the second layer being thicker than the first

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		layer.
Claim 12	Claim 12	US '248 claims the thickness of the first layer being between 10 Å and 150 Å.
Claim 13	Claim 13	US '248 claims the compound having a work function below 3.5 eV and has a higher work function than the material having a work function below 3.5 eV of which the second layer is comprised.
Claim 14	Claim 14	US '248 claims the thickness of the third layer being greater than 1000 Å.
Claim 15	Claim 15	US '248 claims the material having a work function above 3.5 eV having an electrical conductivity greater than 10^5 ($\Omega\cdot\text{cm}$) .
Claim 16	Claim 16	US '248 claims the material having a work function above 3.5 eV is selected from the group consisting of aluminum, gold, and indium-tin oxide.
Claim 17	Claim 18	US '248 claims the opto-electrically active region is light-emissive.
Claim 18-20	Claim 19-21	US '248 claims the opto-electrically active region comprising a conjugated polymer material
Claim 21	Claim 22	US '248 claims a charge transport layer between the light emissive organic material and one of the electrodes.
Claims 22	Claim 7	US '248, claim 7, claims an opto-electrical device comprising: an anode electrode; a cathode electrode; an opto-electrically active region located between the electrodes; the cathode electrode including a first layer comprising an organic complex (carbide) of a group 1 metal, a group 2 metal, or a transition metal; a second layer comprising a material having a work function below 3.5 eV; and a third layer spaced from the opto-electrically active region by the first and second layers and having a work function above 3.5 eV, wherein the first layer is spaced from the opto-electrically active region by the second layer.
Claims 23-41	Claims 1-22	Claims 23-41 are rejected over the reasons stated in the rejection of claims 2-21.
Claims 42-61	Claims 1-22	Claims 42-61 are rejected over the reasons stated in the rejection of claims 1-21.

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Claims 62-64	Claims 4, 6, 7 and 17	Claims 62-64 are rejected over the reasons stated in the rejection of claims 1, 4 and 6.
Claims 65-67	Claims 1-22	Claims 62-64 are rejected over the reasons stated in the rejection of claims 42, 45 and 47.

US Application SN 10/800,575	US Patent No. 6,765,350	Reasons for rejection under obviousness-type double patenting:
Claim 1	Claim 2 in view of Claim 15	<p>US '350, claim 2, claims an opto-electrical device comprising: an anode electrode; a cathode electrode; an opto-electrically active region located between the electrodes; the cathode electrode including a first layer comprising a compound of a group 1 metal, a group 2 metal, or a transition metal; a second layer comprising a material having a work function below 3.5 eV; and a third layer spaced from the opto-electrically active region by the first and second layers and having a work function above 3.5 eV, wherein the first layer is spaced from the opto-electrically active region by the second layer.</p> <p>Claim 2 is silent regarding the cathode being transparent. However, Claim 15 claims said cathode to be transparent. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make transparent the cathode recited by claim 2, in order to allow the transmission of light through the cathode side.</p>
Claims 2-4	Claims 2 and 6	US '350 claims the compound being a compound of a group 1 metal, said metal being Li.
Claims 5-6	Claim 3 in view of Claim 4	US '350, claim 3, claims the compound being a halide. It would have been obvious to one of ordinary skill in the art to use a fluoride as a halide since claim 4 claims the desirability of using fluoride.
Claims 9-10	Claims 2 and 35	US '350 claims the second layer being adjacent to the opto-electrically active layer and said second layer comprises a metal selected from the group consisting of Li, Ba, Mg, Ca, Ce, Cs, Eu, Rb, K, Y, Sm, Na, Sr, Tb, Yb, and alloys of two or more of those.

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Claim 12	Claim 10	US '350 claims the thickness of the first layer being between 10 Å and 150 Å.
Claim 13	Claim 11	US '350 claims the compound having a work function below 3.5 eV and has a higher work function than the material having a work function below 3.5 eV of which the second layer is comprised.
Claim 14	Claim 12	US '350 claims the thickness of the first layer being between 10 Å and 150 Å.
Claim 15	Claim 13	US '350 claims the compound having a work function below 3.5 eV and has a higher work function than the material having a work function below 3.5 eV of which the second layer is comprised.
Claim 16	Claim 14	US '350 claims the thickness of the third layer being greater than 1000 Å.
Claim 17	Claim 16	US '350 claims the material having a work function above 3.5 eV having an electrical conductivity greater than 10^5 ($\Omega \cdot \text{cm}$) .
Claim 18-20	Claim 17-19	US '350 claims the material having a work function above 3.5 eV is selected from the group consisting of aluminum, gold, and indium-tin oxide.
Claim 21	Claim 20	US '350 claims the opto-electrically active region is light-emissive.
Claims 42-61	Claims 1-20	Claims 42-61 are rejected over the reasons stated in the rejection of claims 1-21.
Claims 62-64	Claims 2, 3, 4, 6 and 15	Claims 62-64 are rejected over the reasons stated in the rejection of claims 1, 4 and 6.
Claims 65-67	Claims 1-20	Claims 62-64 are rejected over the reasons stated in the rejection of claims 42, 45 and 47.

Prior Art of Record

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

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Huang et al. (U S6,762,436) and Kita et al. (US 6,656,608) disclose a cathode having a plurality of layers.

Response to Arguments

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to German Colón whose telephone number is 571-272-2451. The examiner can normally be reached on Monday thru Thursday, from 8:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on 571-272-2457. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AC
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Karabi Guharay